



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/849,537	05/07/2001	Tonglong Zhang	1875.0370000	7984

26111 7590 11/17/2006

STERNE, KESSLER, GOLDSTEIN & FOX PLLC  
1100 NEW YORK AVENUE, N.W.  
WASHINGTON, DC 20005

EXAMINER

LEWIS, MONICA

ART UNIT PAPER NUMBER

2822

DATE MAILED: 11/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/849,537

Applicant(s)

ZHANG ET AL.

Examiner

Monica Lewis

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 October 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 13,16,17,52-59 and 69-71 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13,16,17,52-59 and 69-71 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

1. This office action is in response to the response filed October 2, 2006.

#### *Information Disclosure Statement*

2. The information disclosure statement filed 4/06 fails to comply with 37 CFR 1.98(a)(2), which requires **a legible copy of each cited foreign patent document**; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. Applicant needs to provide a copies of the foreign documents. Applicant has only provided an abstract.

#### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 13, 17, 58, 59 , 70 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahn et al. (U.S. Publication No. 2002/0079572) in view of Utagikar et al. (U.S. Patent No. 6,583,513).

In regards to claim 13, Kahn et al. ("Kahn") discloses the following:

- a) a substrate (302) having a plurality of solder balls on a second surface of said substrate (For Example: See Figure 11 and Paragraph 69);
- b) an integrated circuit die (304) that is mounted to said first surface of said substrate (For Example: See Figure 11);

Art Unit: 2822

c) a heat spreader (1102) that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate by an adhesive (1104) between said heat spreader and said substrate and wherein the second surface of said heat spreader is capable of being coupled to a printed circuit board (For Example: See Figure 11); and

d) die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate (For Example: See Figure 11 and Paragraph 69).

In regards to claim 13, Kahn fails to disclose the following:

a) a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate.

However, Utagikar et al. ("Utagikar") discloses a semiconductor device with a ring shaped stiffener (240) being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate as disclosed in Utagikar because it aids in strengthening the substrate (For Example: See Column 6 Lines 56-60).

Additionally, since Kahn and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Kahn.

b) a conductive pad on the first surface of the substrate.

Art Unit: 2822

However, Utagikar discloses a semiconductor device with a conductive pad (160) on the first surface of the substrate (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a conductive pad as disclosed in Utagikar because it aids in providing interconnection (For Example: See Column 4 Lines 24-34).

Additionally, since Kahn and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Kahn.

In regards to claim 17, Kahn fails to disclose the following:

a) a via located proximate to said mounted IC die that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device with a via (170) located proximate to said mounted IC die (110) that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

Additionally, since Kahn and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Kahn.

Art Unit: 2822

In regards to claim 58, Kahn fails to disclose the following:

a) conductive material filling said via thermally couples said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device where the conductive material filling said via thermally couples said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

Additionally, since Kahn and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Kahn.

In regards to claim 59, Kahn fails to disclose the following:

a) conductive material filling said via electrically couples said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device where the conductive material filling said via electrically couples said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

Art Unit: 2822

Additionally, since Kahn and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Kahn.

In regards to claim 70, Kahn discloses the following:

a) the second surface of the heat spreader is plated with solder that allows said second surface of said heat spreader to be surface mounted to soldering pads on the PCB (For Example: See Paragraph 126).

Finally, the following limitation makes it a product by process claim: a) "plated." The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 71, Kahn discloses the following:

- a) a substrate having a plurality of solder balls on a second surface of said substrate (For Example: See Figure 11 and Paragraph 69);
- b) an integrated circuit die that is mounted to said first surface of said substrate (For Example: See Figure 11);
- c) a heat spreader that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate and wherein the second surface of said heat spreader is capable of being coupled to a printed circuit board (For Example: See Figure 11);
- d) die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate (For Example: See Figure 11 and Paragraph 69); and
- e) the second surface of the heat spreader is plated with solder that allows said second surface of said heat spreader to be surface mounted to soldering pads on the PCB (For Example: See Paragraph 126).

In regards to claim 71, Kahn fails to disclose the following:

- a) a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate.

However, Utagikar discloses a semiconductor device with a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate as disclosed in Utagikar because it aids in strengthening the substrate (For Example: See Column 6 Lines 56-60).



Additionally, since Kahn and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Kahn.

b) a conductive pad on the first surface of the substrate.

However, Utagikar discloses a semiconductor device with a conductive pad on the first surface of the substrate (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a conductive pad as disclosed in Utagikar because it aids in providing interconnection (For Example: See Column 4 Lines 24-34).

Additionally, since Kahn and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Kahn.

5. Claims 16 and 52-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahn et al. (U.S. Publication No. 2002/0079572) in view of Utagikar et al. (U.S. Patent No. 6,583,513) and Culnane et al. (U.S. Patent No. 5,744,863).

In regards to claim 16, Kahn fails to disclose the following:

a) a second heat spreader attached to a non-active surface of said IC die and a said second surface of said ring shaped stiffener.

However, Culnane et al. ("Culnane") discloses a semiconductor device with a second heat spreader (270) attached to a non-active surface of said IC die (252) and a said second surface of said ring shaped stiffener (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a second heat spreader attached to a non-active surface

Art Unit: 2822

of said IC die and a said second surface of said ring shaped stiffener as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

Additionally, since Kahn and Culnane are both from the same field of endeavor (semiconductors), the purpose disclosed by Culnane would have been recognized in the pertinent art of Kahn.

In regards to claim 52, Kahn fails to disclose the following:

a) second heat spreader is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive.

However, Culnane discloses a semiconductor device with a second heat spreader that is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive (272) (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a second heat spreader is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

Additionally, since Kahn and Culnane are both from the same field of endeavor (semiconductors), the purpose disclosed by Culnane would have been recognized in the pertinent art of Kahn.

In regards to claim 53, Kahn fails to disclose the following:

a) a second heat spreader is attached to said non-active surface of said IC die with a thermally conductive adhesive.

However, Culnane discloses a semiconductor device where the second heat spreader is attached to said non-active surface of said IC die with a thermally conductive adhesive (274) (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a second heat spreader that is attached to said non-active surface of said IC die with a thermally conductive adhesive as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

Additionally, since Kahn and Culnane are both from the same field of endeavor (semiconductors), the purpose disclosed by Culnane would have been recognized in the pertinent art of Kahn.

In regards to claim 54, Kahn fails to disclose the following:

- a) heat spreader comprises at least one metal.

However, Culnane discloses a semiconductor device a heat spreader comprises at least one metal (For Example: See Column 5 Lines 20-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a heat spreader comprises at least one metal as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

Additionally, since Kahn and Culnane are both from the same field of endeavor (semiconductors), the purpose disclosed by Culnane would have been recognized in the pertinent art of Kahn.

In regards to claim 55, Kahn fails to disclose the following:

- a) at least one metal includes copper.

Art Unit: 2822

However, Culnane discloses that at least one metal includes copper (For Example: See Column 5 Lines 20-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a heat spreader that comprises copper as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

Additionally, since Kahn and Culnane are both from the same field of endeavor (semiconductors), the purpose disclosed by Culnane would have been recognized in the pertinent art of Kahn.

In regards to claim 56, Kahn fails to disclose the following:

a) at least one metal includes aluminum.

However, Culnane discloses at least one metal includes aluminum (For Example: See Column 5 Lines 20-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a heat spreader comprises aluminum as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

Additionally, since Kahn and Culnane are both from the same field of endeavor (semiconductors), the purpose disclosed by Culnane would have been recognized in the pertinent art of Kahn.

In regards to claim 57, Kahn fails to disclose the following:

a) second heat spreader is substantially planar.

However, Culnane discloses a second heat spreader that is substantially planar (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the

Art Unit: 2822

time the invention was made to modify the semiconductor device of Kahn to include a second heat spreader that is substantially planar as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

Additionally, since Kahn and Culnane are both from the same field of endeavor (semiconductors), the purpose disclosed by Culnane would have been recognized in the pertinent art of Kahn.

6. Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kahn et al. (U.S. Publication No. 2002/0079572) in view of Utagikar et al. (U.S. Patent No. 6,583,513) and Culnane et al. (U.S. Patent No. 5,744,863) and Chen et al. (U.S. Patent No. 5,903,052).

In regards to claim 69, Kahn fails to disclose the following:

a) an outer profile of the heat spreader overlaps with an inner profile of the ring shaped stiffener.

However, Chen discloses that an outer profile of the heat spreader (16) overlaps with an inner profile of the ring shaped stiffener (12a) (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include an outer profile of the heat spreader that overlaps with an inner profile of the ring shaped stiffener as disclosed in Chen because it aids in providing the device with good efficiency (For Example: See Column 2 Lines 8 and 9).

Additionally, since Kahn and Chen are both from the same field of endeavor (semiconductors), the purpose disclosed by Chen would have been recognized in the pertinent art of Kahn.

***Double Patenting***

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. Claims 13 and 69-71 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 38, 50 and 51 of copending Application No. 10/939,075 in view of Kahn (U.S. Publication No. 2002/0079572). Although the conflicting claims are not identical, they are not patentably distinct from each other because they both deal with ball grid array packages.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Art Unit: 2822

In regards to claim 13, Zhang et al. ("Zhang") discloses the following:

a) a substrate having a plurality of contact pads on a first surface electrically connected through said substrate to a plurality of solder ball pads on a second surface of said substrate, the first surface of the substrate (For Example: See Claim 38);

b) an integrated circuit die that is mounted to said first surface of said substrate (For Example: See Claim 38);

c) a heat spreader that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate by an adhesive between said heat spreader and said substrate and wherein the second surface of said heat spreader is capable of being coupled to a printed circuit board (For Example: See Claim 38); and

d) a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate (For Example: See Claim 38).

In regards to claim 13, Zhang discloses the following:

a) die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate.

However, Kahn discloses the use of a die that is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate (For Example: See Figure 11 and Paragraph 69). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include the use of a die that is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate as disclosed in Kahn because it aids in electrically and thermally enhancing the package (For Example: See Abstract).

Art Unit: 2822

In regards to claim 69, Zhang discloses the following:

a) an outer profile of the heat spreader overlaps with an inner profile of the ring shaped stiffener (For Example: See Claim 50).

In regards to claim 70, Zhang fails to disclose the following:

a) the second surface of the heat spreader is plated with solder that allows said second surface of said heat spreader to be surface mounted to soldering pads on the PCB.

However, Kahn discloses a semiconductor device where the second surface of the heat spreader is plated with solder that allows said second surface of said heat spreader to be surface mounted to soldering pads on the PCB (For Example: See Paragraph 126). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include a semiconductor device where the second surface of the heat spreader is plated with solder that allows said second surface of said heat spreader to be surface mounted to soldering pads on the PCB as disclosed in Kahn because it aids in electrically and thermally enhancing the package (For Example: See Abstract).

In regards to claim 71, Kahn discloses the following:

a) a substrate having a plurality of contact pads on a first surface electrically connected through said substrate to a plurality of solder ball pads on a second surface of said substrate, the first surface of the substrate (For Example: See Claim 51);

b) an integrated circuit die that is mounted to said first surface of said substrate (For Example: See Figure 51);

c) a heat spreader that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate (For Example: See Claim 51);

d) a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate (For Example: See Claim 51);



Art Unit: 2822

e) said second surface of said heat spreader is capable of being coupled to a printed circuit board (For Example: See Claim 51); and

f) said second surface of said heat spreader is plated with solder that allows said second surface of said heat spreader to be surface mounted to soldering pads on the PCB (For Example: See Claim 51).

In regards to claim 71, Zhang discloses the following:

a) die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate.

However, Kahn discloses the use of a die that is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate (For Example: See Figure 11 and Paragraph 69). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include the use of a die that is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate as disclosed in Kahn because it aids in electrically and thermally enhancing the package (For Example: See Abstract).

9. Claims 16 and 52-57 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 38, 50 and 51 of copending Application No. 10/939,075 in view of Kahn (U.S. Publication No. 2002/0079572) and Culnane et al. (U.S. Patent No. 5,744,863). Although the conflicting claims are not identical, they are not patentably distinct from each other because they both deal with ball grid array packages.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Art Unit: 2822

In regards to claim 16, Zhang fails to disclose the following:

a) a second heat spreader attached to a non-active surface of said IC die and a said second surface of said ring shaped stiffener.

However, Culnane discloses a semiconductor device with a second heat spreader attached to a non-active surface of said IC die and a said second surface of said ring shaped stiffener (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include a second heat spreader attached to a non-active surface of said IC die and a said second surface of said ring shaped stiffener as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

In regards to claim 52, Zhang fails to disclose the following:

a) second heat spreader is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive.

However, Culnane discloses a semiconductor device with a second heat spreader that is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a second heat spreader is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive as disclosed in Zhang because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

In regards to claim 53, Zhang fails to disclose the following:

a) a second heat spreader is attached to said non-active surface of said IC die with a thermally conductive adhesive.

However, Culnane discloses a semiconductor device where the second heat spreader is attached to said non-active surface of said IC die with a thermally conductive adhesive (274) (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include a second heat spreader that is attached to said non-active surface of said IC die with a thermally conductive adhesive as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

In regards to claim 54, Zhang fails to disclose the following:

a) heat spreader comprises at least one metal.

However, Culnane discloses a semiconductor device a heat spreader comprises at least one metal (For Example: See Column 5 Lines 20-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include a heat spreader comprises at least one metal as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

In regards to claim 55, Zhang fails to disclose the following:

a) at least one metal includes copper.

However, Culnane discloses that at least one metal includes copper (For Example: See Column 5 Lines 20-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a heat spreader that comprises copper as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

Art Unit: 2822

In regards to claim 56, Zhang fails to disclose the following:

- a) at least one metal includes aluminum.

However, Culnane discloses at least one metal includes aluminum (For Example: See Column 5 Lines 20-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include a heat spreader comprises aluminum as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

In regards to claim 57, Zhang fails to disclose the following:

- a) second heat spreader is substantially planar.

However, Culnane discloses a second heat spreader that is substantially planar (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include a second heat spreader that is substantially planar as disclosed in Culnane because it aids in improving thermal efficiency (For Example: See Column 2 Lines 35-39).

10. Claims 17, 58 and 59 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 38, 50 and 51 of copending Application No. 10/939,075 in view of Kahn (U.S. Publication No. 2002/0079572) and Utagikar et al. (U.S. Patent No. 6,583,513). Although the conflicting claims are not identical, they are not patentably distinct from each other because they both deal with ball grid array packages.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Art Unit: 2822

In regards to claim 17, Kahn fails to disclose the following:

a) a via located proximate to said mounted IC die that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device with a via located proximate to said mounted IC die that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Kahn to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

In regards to claim 58, Zhang fails to disclose the following:

a) conductive material filling said via thermally couples said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device where the conductive material filling said via thermally couples said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

In regards to claim 59, Zhang fails to disclose the following:

a) conductive material filling said via electrically couples said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device where the conductive material filling said via electrically couples said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Zhang to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

### ***Response to Arguments***

11. Applicant's arguments filed 10/2/06 have been fully considered but they are not persuasive. Applicant argues that "the plastic substrate 302 of Kahn is rigid and therefore does not need to be strengthened by a stiffener. Thus, it clearly would not have been obvious...to modify the semiconductor device of Kahn to include the stiffener of Utagikar." In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Applicant discloses that "a number of packages substrate types exist, including ceramic, plastic, and tape...in some BGA package types, a stiffener may be attached to the substrate to supply planarity and rigidity to the package...the present invention is applicable to all types of BGA substrates, including ceramic, plastic and tape (flex) BGA packages" (For Example: See Paragraph 3 and Paragraph 33). Kahn discloses a plastic substrate (For Example: See

Art Unit: 2822

Paragraph 67). Utagikar discloses a substrate that may be ceramic or flexible tape (For Example: See Column 4 Lines 52-56). Since Applicant has disclosed that the present invention is applicable to substrates made of the same materials as Kahn and Utagikar, there would be motivation to combine.

***Conclusion***

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization

Art Unit: 2822

where this application or proceeding is assigned is 571-273-8300 for regular and after final communications.

ML

November 1, 2006



M. Wilczewski  
Primary Examiner  
TC 2800